CLAIMS

WE CLAIM:

1. A system for monitoring one or more physiological parameters for diagnosis of cardiac conduit condition in patients heart disease, said system comprising:

   One or more implantable sensing devices, said sensing device comprising of at least one inductor coil and at least one sensor, with optional electronic components;

   A non-implantable readout device, said readout device comprising of at least one inductor coil allowing electromagnetic telecommunication and electromagnetic wireless powering.

2. The system of claim 1 wherein said implantable sensing device comprises of at least one capacitive sensor.

3. The system of claim 1 wherein said implantable sensing device includes a battery.

4. The system of claim 4 wherein said battery is rechargeable using wireless means.

5. The system of claim 1 wherein said physiological parameters include pressure.

6. The system of claim 1 wherein said physiological parameters include pressure gradient.

7. The system of claim 1 wherein one or more sensing devices are measuring one or more of the following pressures:

   pulmonary artery,

left atrium,

right atrium,

left atrium appendage,

right atrium appendage,

mean left atrium pressure,

mean right atrium pressure,

differential pressure between left and right atrium.

8. The system of claim 7 wherein said system calculates the change of pressure over time, dp/dt.

9. The system of claim 1 wherein said implantable sensing devices are located within said conduit.

10. The system of claim 1 wherein said implantable sensing devices are located at one or both ends of said conduit.

11. The system of claim 1 wherein said implantable sensing devices are located in the vicinity of the conduit.

12. The system of claim 1 wherein said implantable sensing device is used for indication of occlusion.

13. The system of claim 1 wherein at least two implantable sensing devices are used for locating occlusion.

14. The system of claim 1 wherein at least two implantable sensing devices are used for measurement of flow rates.

15. The system of claim 1 wherein data from said implantable sensing devices is used for estimation of time-to-failure within said conduit.

16. The system of claim 1 wherein said implantable sensing devices are used for one or more of the following diagnosis:
assessment of stenosis,
assessment of occlusion
assessment of inefficiency of cardiac conduits.

17. The system of claim 1 wherein one or more of the following schemes are used:
resonant,
passive,
active.

18. The system of claim 1 wherein the physiologic parameter being measured is one or more of the following parameters:
pressure,
temperature,
flow,
blood composition,
blood gas content,
chemical composition,
chemical concentration,

acceleration,

vibration.

19. The system of claim 1 wherein said system is used for one or more of the following applications:

early diagnosis of stenosis in cardiac conduits,

early diagnosis of occlusion in cardiac conduits,

early diagnosis inefficiency of cardiac conduits.

early diagnosis of congenitial heart diseases and related conditions,

early intervention in treatment of congenital heart diseases and related conditions,

remote monitoring of patients with congenital heart diseases and related conditions,

tailoring of medications,

disease management,

identification of complications from conduit condition in patients with congenital heart diseases related conditions,

identification of complications from conduit condition in patients with congenital heart diseases related conditions,

treatment of complications from conduit condition in patients with congenital heart diseases related conditions,

treatment of complications from conduit condition in patients with congenital heart diseases conditions,

feedback regarding the impact of medication on the heart,

reduction in frequency and severity of hospitalizations due to congenital heart diseases,

reduction in frequency and severity of hospitalizations due to congenital heart diseases,

identification of mitral valve stenosis,

treatment of mitral valve stenosis including but not limited to surgery and balloon angioplasty,

20. The system of claim 1 wherein said readout device is capable of performing one or more of the following:

remote monitoring of cardiac conduits in heart disease patients, including but not limited to home monitoring,

monitoring of cardiac conduits in heart disease patients with telephone-based (or similar method) data and information delivery,

monitoring of cardiac conduits in heart disease patients with wireless telephone-based (or similar method) data and information delivery,

monitoring of cardiac conduits in heart disease patients with web-based (or similar method) data and information delivery,

closed-loop drug delivery to treat heart disease,

closed-loop tuning of medical systems to treat heart disease or congenital heart disease related conditions,

warning systems for critical worsening of cardiac conduits in heart disease patients,

portable or ambulatory monitoring or diagnostic systems,

battery-operation capability,

data storage,

reporting global positioning coordinates for emergency applications,

communication with other medical devices including but not limited to pacemakers, defibrillator, implantable cardioverter defibrillator, implantable drug delivery systems, non-implantable drug delivery systems, and wireless medical management systems.

21. The system of claim 1 wherein said implantable sensing device is implanted using a minimally invasive outpatient technique.

22. The system of claim 1 wherein a catheter delivery method is used to implant said implantable sensing device.

23. The system of claim 1, wherein said implantable sensing device uses anchoring mechanisms including but not limited to those used in one or more of the following:
septal occluder devices,
left atrial appendage occluders,
cardiac pacing leads,
screws,
tines,
stents.

24. The system of claim 23 wherein said anchoring mechanism is a part of the conduit.

25. The system of claim 23 wherein said anchoring mechanism utilizes an anchor that passes through a septum wall and opens on one or both sides of a septal wall, clamping said implantable device to the wall.

26. The system of claim 23 wherein said anchoring mechanism utilizes an anchor that passes through the atrial septum.

27. The system of claim 26 wherein the anchoring method is similar to anchoring of septum occluder devices, wherein two umbrella-shaped anchors one on each side which anchor the sensing device.

28. The system of claim 26 wherein the larger portion of said implantable sensing device is located in the right side of the heart and the smaller portion of said implantable sensing device is located in the left side and includes at minimum one sensor, in order to minimize the risk of thrombogenicity.

29. The system of claim 23 wherein said anchoring mechanism is a helical screw.

30. The system of claim 23 wherein said anchoring mechanism is a tine that expands and catches on a tribeculated area of the heart.

31. The system of claim 23 wherein said anchoring mechanism is made from one or more or any combination thereof the following materials:

nitinol,

teflon,

stainless steel,

polymer,

titanium,

biocompatible metals.

32. The system of claim 1 wherein said implantable sensing device is augmented with one or more actuators including but not limited to:

thermal generators,

voltage sources,

current sources,

probes,

electrodes,

drug delivery pumps,

valves,

meters,

microtools for localized surgical procedures,

radiation emitting sources,

defibrillators,

muscle stimulators,

pacing stimulators.

33. The system of claim 1 wherein said system is part of a closed-loop medical treatment system.

34. The system of claim 1 wherein at least a portion of said implantable sensing device is coated with one or more layers of thin coatings.

35. The system of claim 34 wherein the coating materials include but are not limited to one or more or any combination thereof:

silicone,

hydrogels,

parylene,

polymer,

nitrides,

oxides,

nitric-oxide generating materials,

carbides,

silicides,

titanium.

36. The system of claim 1 wherein said cardiac conduit includes a valve.

37. The system of claim 36 wherein said system is incorporated into an closed-loop system for control of said valve in said cardiac conduit.

38. The system of claim 36 wherein said system is incorporated into an open-loop system for control of said valve in said cardiac conduit.